

DEQ Nutrient Work Group 3rd Meeting Summary July 16, 2009

Introductions

Gerald Mueller, the Nutrient Work Group (NWG) facilitator, and those attending this meeting introduced themselves. A list of the members and others in attendance is attached below as Appendix 1.

Agenda

- Review of the June 18, 2009 Meeting Summary
- Update on Dr. Mike Suplee's Visit with EPA Headquarters Economist
- EPA's Response to the Nutrient Standard Variance and the MPDES Permit Shield
- Translation of a 150 mg/m² Algae Standard Level into an Instream Nitrogen and Phosphorus Level
- Stream Impairment Determinations
- NWG Work Plan
- Next Meeting Schedule

Review of the June 18, 2009 Meeting Summary

One comment was made on the meeting summary. The discussion of the NWG work plan stating should have included mention of an item addressing how permits will be written.

Update on Dr. Mike Suplee's Visit with EPA Economist

On a recent trip to Washington DC, Dr. Suplee met with Tim Connor, EPA Headquarters Economist, about the 1% median household income (MHI) cost cap on compliance with numeric nutrient criteria. The group formed by DEQ in September 2008 to provide advice about an affordability variance from nutrient standards recommended a 1% of MHI cost cap if substantial and widespread impacts would occur from meeting nutrient standards. Dr. Suplee expressed the view that a 1% cap makes sense in Montana because non-point sources are significant contributors to the state's water quality problems. While Mr. Connor did not express approval or disapproval of the 1% cap, he did indicate that a cap lower than the 2% level that EPA prefers for large eastern cities may make sense for Montana. He stated that a cap greater than 1% would be appropriate in the cases in which a waste water facility is the bulk of the water quality problem.

Question - Is Mr. Connor aware of the Nutrient Work Group?

Answer - Yes.

EPA's Response to the Nutrient Standard Variance and the MPDES Permit Shield

Dave Moon, EPA Region 8 Water Quality Standards Team Coordinator, participated in the meeting by telephone and discussed EPA's view of nutrient standard variances and read an email from Bruce Kent (EPA Region 8 Permits Section), regarding an MPDES permit shield. Mr.

Kent was unable to participate in today's meeting. Tina Laidlaw addressed questions to EPA from last month's NWG meeting.

Nutrient Standard Variances - Mr. Moon stated that variances have been a part of EPA's water quality program for a long time. Few states, however, have adopted a variance. Variances are addressed in the EPA water quality handbook and subject to 1995 guidance. One court decision, Catskill Mountain Chapter of Trout Unlimited vs. the City of New York, addressed variances. See the attached memo describing the case law on variances. The court ruled in favor of a variance if meeting the water quality baseline limit is not feasible. Mr. Moon will provide a summary of this decision for posting on the NWG web page (<http://www.deq.mt.gov/wqinfo/NutrientWorkGroup/index.asp>). Because EPA will have to approve each variance, Mr. Moon recommended that his agency be involved with the development of Montana's approach to variances.

Question - Are variances available for only single discharge permits, or for classes of dischargers?

Answer - Multi-discharger variances have been issued. In Ohio, multi-discharge variances were issued for mercury standards when widespread problems were demonstrated with compliance below certain levels.

Comment - I am under the impression that compliance with the base numeric nutrient standard levels under consideration would not be feasible for many dischargers. Obtaining EPA sign off on individual permits will be a major production. Variances for classes would be a good idea.

Response - We will research what happened in Region 5, which includes Ohio, about multi-discharger variances. These variances may provide an alternative to individual rule making.

Question - Will DEQ have to develop a rule for each variance from nutrient standards for each discharge permit?

Answer by George Mathieus - Yes; however, the rule would be adopted by the department, not the Board of Environmental Review (BER). We estimate that six to eight variances would be considered annually. We would seek to line the variance processes with the discharge permit processes.

Comment - The DEQ has experience regarding the Mike Horse Mine with doing so.

Question - Am I correct that the BER adopts the numeric nutrient water quality standards, but variances to them would be issued by DEQ?

Answer by George Mathieus - Yes. EPA would have to review and sign off on each variance issued by the DEQ.

Question - Will the EPA review be a rule making process with provisions for public involvement?

Answer - No. EPA would issue an action letter after reviewing a variance. The letter is not the result of a formal rule making process with public involvement. After DEQ approves a variance, it has 30 days to submit its decision to EPA, and EPA then has 60 days within which to issue an action letter approving or disapproving the variance.

Comment - Six to eight variance requests annually seems like to low a number.

Response by George Mathieus - The six to eight number is based on my analysis of the DEQ permit load. Currently, DEQ faces a permit backlog, but we do not foresee a 20 variance request annually once the backlog is addressed.

Response by Dr. Suplee - As long as the permit shield is in place, dischargers should be okay. We don't see a big block of variance requests because of the requirement for designing and implementing waste water plant upgrades. It will take some time (usually years) - after there is an acknowledgment that a variance for a particular discharger is needed - to complete the engineering and financing phase and then arrive at the point where the variance would be carried through rule making.

Question - Is DEQ standards staff meeting with its permitting counter parts?

Answer by George Mathieus - Yes. We are hopeful that we will address rule making as a package.

Comment - It would be worthwhile to have DEQ permit staff come to this meeting. The permit backlog is about 120-130. All permits must be reviewed every five years. I don't see how variance requests would be as low as six to eight per year.

Response by George Mathieus - We have been including permitting staff in our discussions. A representative of the Permitting and Compliance Division would have been at this meeting except that she is on annual leave.

Question - The BER would adopt the rule for the base numeric nutrient criteria and the variance process. What would the role of EPA in this rule making?

Answer - Once BER adopts the rule, EPA would review it.

Question - Does DEQ have a [flow chart](#) for the process beginning with the initial BER rule adoption and the issuances of variances and discharge permits?

Answer by Dr. Suplee - Yes, we will have it posted on the NWG web site.

Question - What is the EPA's response to the discharge permit backlog? Is the DEQ program in jeopardy because of it?

Answer - EPA has been working with DEQ regarding is level of permitting for several years. The rate of permit processing has improved over the last two years. DEQ has been beating its quarterly and annual permit targets.

Question - In the near term, will there be more permits than six to eight per year?

Answer by George Mathieus - DEQ is increasing permitting efficiency. As already stated, we have increased the rate of permit processing over the last two years. We do not see a big slug of permits on the horizon annually.

Comment - I am concerned about the overall process we have discussed. I don't believe that compliance with it will be feasible. The permit backlog is 12-130. Even with the permit shield, individual dischargers will need variances. We need to understand the overall process. A multi-discharger variance would make compliance more believable.

MPDES Permit Shield - Dave Moon read the following statement from Bruce Kent regarding EPA's view of the permit shield:

"If the new nutrient criteria is more stringent than the old criteria and the wqs allow a compliance schedule for the new nutrient criteria, the renewal permit can include a compliance schedule to achieve the new criteria. The compliance schedule could contain interim limits based on the old criteria and a schedule for meeting limits based on the new criteria. The permit must have final limits based on the new criteria that become effective at the end of the schedule. [The schedule could (but not recommended) extend beyond the term of the permit.] During the schedule, the permittee could seek the variance and if granted the permit could be reopened to remove the schedule and final compliance dates. If the variance isn't granted, the schedule remains in effect and the permittee will be on schedule to meet any limits based on the new criteria.

The other option for MDEQ is to administratively extend the old permit until they can issue a new permit. Depending on how long the variance request/approval takes, it could add to MTs currently unacceptable number of backlogged permits."

Because neither Mr. Kent nor his superior was available for this meeting, we will discuss this topic again at the next NWG meeting in August.

Comment - If DEQ has a written legal opinion regarding the permit shield, sharing it with this group would be helpful.

Comment - Mr. Kemp's statement seems to imply two means of providing the shield. One is based on administrative extension and the other on numeric standards with compliance periods. Conditional permits based on numeric standards make me nervous.

Questions from the June NWG Meeting - Ms. Laidlaw stated that other states have not used public perception surveys to set nutrient criteria levels for streams and rivers. Iowa and New York are using such surveys but have not yet started rule making to adopt nutrient criteria. West Virginia used a public perception survey for criteria for lakes and reservoirs.

Question - What methodology was used in the surveys in these three states?

Answer - The methodology is apparently different in each state. We do not yet have the report from West Virginia, so I can't comment on the specific methodology used there. The nutrient criteria are under development in New York. Iowa's survey included some 8,000 responses. Categories involved qualitative pollution levels, e.g. very polluted.

Answer by Dr. Suplee - Several published papers exist in the literature regarding use of public perception surveys in setting nutrient standards. Papers are available addressing Lake Champlain in New York, New Zealand, and lakes in Minnesota.

Translation of a 150 mg/m² Algae Standard Level into an Instream Nitrogen and Phosphorus Level

Dr. Suplee discussed this topic using a PowerPoint presentation entitled “[DEQ’s Approach to Developing Numeric Nutrient Standards for Wadeable Streams and Rivers](#).” This presentation will be posted on the NWG web page. Key points from his presentation include:

Where does 150 mg Chl *a*/m² benthic algae fit into the larger picture?

- 150 milligrams of chlorophyl *a* per square meter (mg Chl*a*/m²) is viewed as a nuisance threshold by the Montana public.
- 150 mg Chl*a*/m² rarely occurs in individual samples from western Montana reference streams, and never occurs as a reach average. Samples at or above this level are somewhat more common in eastern Montana prairie streams.
- In temperate streams worldwide that manifest a wide range of eutrophication, more than 90% of the streams have an average benthic algal chlorophyl *a* concentrations less than 150 mg/m².

Gravel bottom wadeable streams of (mainly) western Montana

- A regional whole-stream fertilization study, which added nutrients at approximately DEQ’s draft criteria, resulted in mean benthic algae of 150 mg Chl *a*/m², compared to 5 mg Chl *a*/m² in the control.
- Salmonid growth & survival is enhanced by increased nutrients and algal production, but further increases in nutrients leads to fishery impairment.
- Risk of dissolved oxygen (DO) problems, salmonid fishery impairment, and significant alterations in macroinvertebrate communities increases when algae concentrations are greater than 150 mg Chl *a*/m².
- DEQ used this value as a harm-to-use threshold for salmonid streams.

Wadeable prairie streams of eastern Montana

- Since benthic algae levels greater than or equal to 150 mg Chl *a*/m² are more common in prairie streams, and these streams are physically very different than gravel-bottom trout streams, this algae threshold was not considered an appropriate harm threshold for prairie streams.
- DEQ has shown a linkage between DO levels and nutrients in prairie streams, therefore the nutrient criteria are currently being set to maintain state DO standards.

Criterion identification process

- Derivation involves examination of regionally-applicable stressor response studies. The linkage to reference data helps overcome uncertainty inherent to each stressor-response study.
- Studies from other northern temperate regions generally result in same order-of-magnitude nutrient concentrations that protect uses

Highlights of the NWG member questions and comments during and in response to the presentation follow.

Question - Are the eastern Montana reference streams impacted by man’s activities?

Answer - We have two types of reference streams: Tier 1, which are generally as close to pristine as we can identify, and Tier 2, which have been affected by human activities but have best management activities in place so that the streams are minimally impacted and are meeting their beneficial uses. Eastern Montana reference streams tend to be Tier 2.

Question - What is the amount of hardness of the water in the reference streams?

Answer - In western Montana, waters are generally at 100 mg per liter of calcium carbonate. Filamentous algae (*Cladophora*, particularly) like hard water.

Question - What are the sources of the data for impacts on salmonids?

Answer - Data are from British Columbia, New Zealand, and Idaho.

Question - Has there been research on this subject in Montana?

Answer - Although we could conduct it, such research has not occurred in Montana.

Comment - This appears to be important in transitional streams.

Comment - Eastern cretaceous rocks result in high natural nutrient levels in streams.

Question - Have you looked at the difference between glaciated and unglaciated areas?

Answer - Yes, the reference sites include both areas. Interestingly, concentrations (the median, for example) in streams in the reference sites in both areas are very similar. We have a dose-response study in the northwestern plains area which is glaciated. Starting this summer, we will carry out a dose-response study in a prairie stream in the southeastern plains, an unglaciated area.

Question - What would be the range of the algae standard levels if you looked at uses other than salmonids?

Answer - The nutrient standards would likely be on the same order of magnitude if they would be based on other uses. We are continuing to study the linkage between nutrients and DO.

Comment - This presentation has been very helpful. I am wondering, however, about the affect of algal concentrations between 150 mg Chl a/m² and the higher levels at about 350 mg Chl a/m². Knowing the rate of change of risk to the uses as a function of levels above 150 mg Chl a/m² would be useful. It might be significant for standard setting.

Response - This is a fair comment. Macroinvertebrate changes occur through this range. Some streams in the Pacific Northwest have a nutrient deficit because of greatly reduced returns of salmonids, and are now said to have become oligotrophic. Nutrients are added to these streams in amounts known as "salmon carcass equivalents" to help boost survival of the juvenile salmon that are spawned.

Question - Don't the biologic effects of nutrients take time to develop?

Answer - - The data do not support this proposition. Algae production occurs very quickly during the summer when nuisance algal growth can often develop in 5-10 days.

Question - Do short-term spikes in nutrient concentrations have biological effects?

Answer - No. About 10% of the data collected from any given reference site exceed the draft nutrient criteria, yet, there is no significant biological effects. If the spike endures somewhat, however, changes can occur.

Question - How long a period is needed for shifts to occur in aquatic insect populations?

Answer - Algae concentrations changes occur in days to weeks. Insect population changes occur over months to a year.

Answer by Bob Bukantis - Changes can occur fairly rapidly. Insects track changes to their food base. At about 150 mg Chl a/m² algae generally shifts from diatomic to filamentous, and this change affects insect populations.

Question - The algorithm you showed [$\ln \text{Chl } a (\mu\text{g}/\text{cm}^2) = 1.042 \cdot \ln \text{SRP } (\mu\text{g}/\text{L}) + 0.433$] related algae concentrations only to soluble reactive phosphorus. How does nitrogen concentration figure in?

Answer - Other equations we've looked at incorporate both nitrogen (N) and phosphorus (P). We (or the study author) try to establish whether N or P concentrations will be limiting. Commonly, the non-limiting nutrient is then set at the Redfield ratio relative to the limiting nutrient. Red field ratio, or higher values in regions where P is more limiting, is often seen in the concentrations at reference sites.

Question - For the Clark Fork River Voluntary Nutrient Reduction Program, we began with flow levels based on 7Q10 values, i.e. the minimum flow over 7 consecutive days that occurs on average once every 10 years, and we ended up using 10Q30, i.e. the minimum flow over 10 consecutive days that occurs on average once every 30 years. Consideration of flow is important because at low enough flows, treatment won't help. What flow conditions will be used to set the nutrient standards?

Answer - We have not yet decided. For the Yellowstone River, which is not a wadeable stream, 7Q10 values will be used in the low-flow modeling runs.

Comment - DEQ should involve DNRC in establishing TMDL flow levels.

Question - You have said that the standards will apply during the summer for streams but year round if the streams feed into lakes. Since many streams at some point feed into lakes, are the effects that would be considered near field or far field?

Answer - Streams that feed major lakes such as Flathead Lake will be subject to year round levels; most other streams will be seasonal. The situation is not clear regarding reservoirs. The law states that the reasonable operation of dams is considered natural. The group should discuss this.

Comment - For facility planning regarding TMDLs, we need specific guidance as to near and far field effects.

Response - You should visit with Dean Yashan about TMDL requirements.

Comment - I agree that this presentation was very helpful. We should, however, look at the linkage between the 150 mg Chl a/m² or DO and instream nitrogen and phosphorus levels as well as between beneficial use impacts and algae or DO concentrations.

Comment - It is politically difficult to relax water quality standard levels.

Response - Actually, water quality standards are revised all the time. This was not the case with ammonia. As additional information became available, the standard for it was relaxed without controversy.

Question - For the next NWG meeting, would DEQ conduct sensitivity analyses to determine the nitrogen and phosphorus criteria over a range of algae concentrations, i.e. 100, 125, 150, 175, and 200 mg Chl a/m²?

Answer - Yes.

Comment - We should acknowledge the tension between protective and anticipatory standard levels and levels that are reactive based on adaptive management. By law, standards must be protective and anticipatory.

Comment - Absent the recreational use impacts, the correct level for the nutrient standard appear fuzzier. Setting the standard on a perception of use basis will be highly contested.

Comment - We need to understand how a given level of numeric criteria will impact permitting.

Stream Impairment Determinations

Dr. Suplee discussed this topic using a PowerPoint presentation entitled “[Montana’s Approach to Using Numeric Nutrient Standards to Assess Wadeable Streams and Rivers](#).” This presentation will also be posted on the NWG web page. Dr. Suplee’s summary of his presentation made the following points.

- DEQ’s internal 303(d) assessment methodology will accompany numeric nutrient standards.
- Minimum nutrient dataset per assessment reach assures greater statistical certainty.
- Nutrient standards will not be set on a “no sample shall exceed” basis.
- The assessment procedure will include statistical tests of nutrient concentrations, and a measure of the effected use (benthic algae, DO).
- The consequences of false positive and false negative error rates, respectively, are unnecessary expense to regulated entity, and unwanted degradation of the environment. In setting the standards the error rates of both will be roughly balanced.

Highlights of the NWG member questions and comments during and in response to the presentation follow.

Question - How many samples are taken in a stream reach?

Answer - 12 to 13 samples per reach would be preferred.

Question - Why do you lump nitrogen and phosphorus together when determining the allowable exceedance rate?

Answer - From the Clark Fork River data analysis, we got the same answer regardless of whether we lumped together or treated them separately.

Question - What is the time relationship between the algae measurement and the nitrogen and phosphorus measurement?

Answer - Since we are assessing streams for inclusion on the 303(d) list of impaired streams, the time relationship does not matter.

Question - The nutrient data for the Clark Fork River cover a nine year period. The last couple of years had better flows. What is the affect of the drought cycle on stream assessments?

Answer - We will be looking at each year individually and the ten year average when making this analysis again in the next 6 months.

Question - Do you expect that the new exceedance rate will affect stream listings?

Answer - We probably have too many streams listed for nutrients. As more data are collected and a new assessment is conducted, the number will probably drop.

Question - What is the status of the 303(d) assessment?

Answer - We will begin to assess streams next year with the new process. A higher nutrient standard (i.e., higher concentration) would likely shrink the allowable exceedance rate.

Comment - While I like the rigor of this approach, I wonder about the independence of the samples.

Response - Independent samples are difficult to achieve on streams. Temporally, we are confident about independence because we take samples at least a month apart and have applied time-series tests to assure independence. Spatial independence is a fuzzier issue. As a rule of thumb, sample sites must be at least separated by a mile, and we prefer that between samples a tributary enters or a land use change occurs.

Question - Your analysis seems to boil down to chlorophyll a concentrations. Why not just regulate chlorophyll a rather than nitrogen and phosphorus?

Answer - We intend to set criteria for chlorophyll *a* and for nitrogen and phosphorus. Analyzing both provides more information about whether nitrogen or phosphorus is causing the nutrient problem.

Question - What is the permit implication of having acceptable levels of nitrogen and phosphorus but having algae levels that are too high?

Answer - If we set the criteria for nitrogen and phosphorus correctly, this question won't arise.

Question - How will you enforce an algae criteria, since permits don't address algae levels?

Answer - This is a good question; we are aware that dischargers are not currently required to measure algae concentrations.

*Question - You said that each assessment reach will have 12 to 13 sampling sites. How many sites must exceed the 150 mg Chl *a*/m² level before a stream is declared impaired?*

Answer - We assume that the decision reach is uniform, therefore if one site along it shows algae concentrations greater than 150 mg Chl *a*/m², then we consider the reach to have elevated algae.

Comment - When we design facilities, we need to anticipate permit requirements. You need to involve permit personnel earlier in the standard setting process.

Response - Permitting is based on existing standards. However, we are keeping permitting staff in the loop of our nutrient criteria and standards development.

NWG Work Plan

Comment - It is difficult to predict what the end-of-pipe requirement for nitrogen and phosphorus will be because of the TMDL process. The watershed plan sets the loads. Non-point pollution needs to be included in the assessment process.

Comment - We need to be able to work through an example, such as the Lake Helena plan, to understand how the implementation of TMDLs will affect nutrient criteria permits.

Those NWG members present at this meeting agreed to add two topics to the work plan: the translation of base numeric nutrient criteria into discharge permits and an analysis of the economic impacts of base numeric nutrient standards.

Comment by Bob Bukantis - The economic analysis would likely consist of a cost-benefit analysis of adopting base numeric nutrient criteria.

Comment by Dr. Suplee - I will provide a copy of a paper addressing the economic cost of eutrophication by Dr. Dodds. Because of copyright concerns, we may not be able to post it on the NWG web page.

Public Comment

There was no additional public comment.

Next Meeting

The next meeting is scheduled for Thursday, August 20 at a location in Helena to be announced. The agenda will include three topics: EPA's response to the permit shield, DEQ's sensitivity analysis of different levels of the algae criteria used to set the base numeric criteria for nutrients, and a discussion of how the base numeric standard would be translated to permit decisions with DEQ permit, TMDL, and water pollution control revolving fund staff. A state legal opinion on the permit shield may also be discussed.

**Appendix 1
NWG Attendance List
July 16, 2009**

Members

Scott Murphy	Morrison-Maierly, Inc.
Chris Brick	Clark Fork Coalition
Brian Sugden	Plum Creek
Terry McLaughlin	Smurfit-Stone Container
John Youngberg	Montana Farm Bureau
Ryan Swinney	Bruce Swinney & Associates
John Rundquist	City of Helena
Dick Hoehne	Town of Philipsburg
Michael Perrodin	BNSF Railway
Jeff Tiberi	Montana Association of Conservation Districts
John Wilson	City of Whitefish
Donald Quander	Holland & Hart
Don Allen	Western Environmental Trade Association (WETA)
Jim Edgcomb	Montana Department of Commerce/Treasure State Endowment Program
Jim Jenson	Montana Environmental Information Center
Dave Aune	Great Western Engineering

Alternate Members

Dave Galt	Montana Petroleum Association (Alternate for Donald Quander)
Doug Parker	Hydrometrics (alternate for Debbie Shea)
Haley Beaudry	Columbia Falls Aluminum Company (Alternate for Terry McLaughlin)

Non-Voting Members

George Mathieus	Department of Environmental Quality (DEQ), WQP Bureau Chief
Dr. Mike Suplee	DEQ, Water Quality Standards Section, Water Quality Specialist

Other Meeting Participants

Tina Laidlaw	US Environmental Protection Agency (EPA)
Ron Steg	EPA
Bob Bukantis	DEQ, Water Quality Planning, Water Quality Standards Section Supervisor
Mark Simonich	Helena Association of Realtors
Kristi Kline	Montana Rural Water Systems
Jessie Luther	Browning, Kaleczyc, Berry, and Hoven
Amanda McInnis	H2R